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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference E-2112/04	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/EP2004/050434	International filing date *(day/month/year)* 02.04.2004	Priority date *(day/month/year)* 04.04.2003
International Patent Classification (IPC) or national classification and IPC B60K17/16, F16H48/30		
Applicant FERRARI S.P.A. et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 7 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 16 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
31.12.2004	17.02.2005
Name and mailing address of the international preliminary examining authority: European Patent Office - Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840	Authorized Officer Wisnicki, M Telephone No. +49 30 25901-538

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/050434

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages	
1, 3-11	as originally filed
2, 2bis	filed with telefax on 31.12.2004
Claims, Numbers	
1-38	filed with telefax on 31.12.2004
Drawings, Sheets	
1/4-4/4	as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-38
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-38
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-38
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following document:

D1: DE-A-36 37 820

2 Document D1, which is considered to represent the most relevant state of the art, discloses:

A rear-drive vehicle comprising:
a self-locking differential;
an engine producing a drive torque which is transmitted to the rear drive wheels by the self-locking differential;
an accelerator pedal which modulates the drive torque generated by the engine;
a brake pedal which modulates a brake torque acting on the vehicle;
a number of sensors for real-time detecting respective dynamic parameters of the vehicle;
a regulating device for regulating the lock percentage of the differential; and
a central control unit for controlling the regulating device to regulate the lock percentage of the differential as a function of the dynamic parameters of the vehicle;

The subject-matter of claim 1 differs from this known vehicle in that when cornering the central control unit reduces the lock percentage of the differential when the accelerator pedal is pressed and increases the lock percentage of the differential when the accelerator pedal is released.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to increase the stability of a motor vehicle.

The solution to this problem proposed in claim 1 of the present application is considered

as involving an inventive step (Article 33(3) PCT) for the following reasons:

By reducing the lock percentage of the differential when the accelerator pedal is pressed and increasing the lock percentage of the differential when the accelerator pedal is released during vehicle cornering the vehicle is stabilised.

The combination of the features of claim 1 is neither known from, nor rendered obvious by, the available prior art. Therefore the skilled person would not find any indications to solve the problem in the way proposed in the present application.

Claims 2-23 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

2.1 The subject-matter of claim 24 differs from the vehicle known from D1 in that the vehicle comprises two torque sensors, each of which is connected to the central control unit, is fitted to a respective axle shaft, and real-time detects the value of the torque transmitted by the self-locking differential to the respective rear wheel via the relative axle shaft; the central control unit controlling the regulating device to regulate the lock percentage of the differential as a function of the value of the torque transmitted by the self-locking differential to each rear wheel.

The subject-matter of claim 24 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to increase the stability of a motor vehicle.

The solution to this problem proposed in claim 24 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

Real-time detecting of the value of the torque transmitted by the self-locking differential to the respective rear wheel via the relative axle shaft provides the central control unit with actual torque value. The control unit uses the data for controlling the regulating device to regulate the lock percentage of the differential as a function of the value of the torque transmitted by the self-locking differential to each rear wheel, improving the

stability of the vehicle.

The combination of the features of claim 24 is neither known from, nor rendered obvious by, the available prior art. Therefore the skilled person would not find any indications to solve the problem in the way proposed in the present application.

Claims 25-30 are dependent on claim 24 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

2.2 The subject-matter of claim 31 differs from the vehicle known from D1 in that when cornering at substantially steady speed, the central control unit estimates the road grip of the wheels, zeroes the lock percentage of the differential when the road grip of the wheels is far from the grip limit, and gradually increases the lock percentage of the differential when the road grip of the wheels nears the grip limit.

The subject-matter of claim 31 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to increase the stability of a motor vehicle.

The solution to this problem proposed in claim 31 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

By zeroing the lock percentage of the differential when the road grip of the wheels is far from the grip limit, and gradually increasing the lock percentage of the differential when the road grip of the wheels nears the grip limit the stability of the vehicle is increased.

The combination of the features of claim 31 is neither known from, nor rendered obvious by, the available prior art. Therefore the skilled person would not find any indications to solve the problem in the way proposed in the present application.

Claims 32-37 are dependent on claim 31 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

2.3 The subject-matter of claim 38 differs from the vehicle known from D1 in that when driving along a substantially straight route, the central control unit zeroes the lock percentage of the differential in normal driving mode, and gradually increases the lock percentage of the differential in sport driving mode.

The subject-matter of claim 38 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to adjust the driving characteristics of a motor vehicle to different driving modes.

The solution to this problem proposed in claim 38 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

By zeroing the lock percentage of the differential in normal driving mode, and gradually increasing the lock percentage of the differential in sport driving mode while driving along a substantially straight route, it is possible to achieve different characteristics of the vehicle in various driving modes.

The combination of the features of claim 38 is neither known from, nor rendered obvious by, the available prior art. Therefore the skilled person would not find any indications to solve the problem in the way proposed in the present application.

on the vehicle controls to prevent the vehicle spinning.

US4741407 discloses a system for controlling limited-slip differential gear unit for automotive vehicle. The control system for the limited-slip differential gear unit is associated with a suspension control system to receive therefrom a suspension mode indicative signal to select one of a plurality of preset characteristics to derive a slip-limit control signal; the limited-slip differential gear unit includes a slip-limit adjusting mechanism which is responsive to the control signal for adjusting the slip-limitation to be generated by the limited-slip differential gear unit.

US5152362 discloses a driving torque distribution control system for vehicle; the control system comprises a clutch for limiting a differential action between left and right drive wheels or varying a driving torque distribution between front and rear axles of a 4WD vehicle, a sensor group, and a controller for controlling an engagement force of the clutch to control the differential limiting force or the torque distribution between the front and rear drive wheels. The sensor group includes an accelerator position sensor and a lateral acceleration sensor; the controller increases the clutch engagement force as the speed of increase of the accelerator opening degree increases, and increases the rate of increase of the clutch engagement force with respect to the increasing speed of the accelerator opening degree when the lateral acceleration increases.

DISCLOSURE OF INVENTION

It is an object of the present invention to provide a rear-drive vehicle featuring a self-locking differential, being cheap and easy to produce, and, at the same time, eliminating the aforementioned drawbacks.

According to the present invention, there is provided a rear-drive vehicle featuring a self-locking differential, as claimed in Claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic plan view of a rear-drive vehicle in accordance with the present invention;

Figure 2 shows an operating diagram of a self-locking differential of the Figure 1 vehicle;

Figure 3 shows a control method implemented by a central control unit of the Figure 1 vehicle;

Figure 4 shows a further control method implemented by a central control unit of the Figure 1 vehicle.

BEST MODE FOR CARRYING OUT THE INVENTION

Number 1 in Figure 1 indicates a vehicle having two front wheels 2 and two rear drive wheels 3, and comprising a front internal combustion engine 4 producing a drive torque Tm which is transmitted to rear drive wheels 3 by a power train 5. Power train 5 comprises a clutch 6 housed in a casing integral with engine 4 and

CLAIMS

1) A rear-drive vehicle (1) comprising:

a self-locking differential (9);

an engine (4) producing a drive torque (Tm) which is transmitted to the rear drive wheels (3) by the self-locking differential (9);

an accelerator pedal (14) which modulates the drive torque (Tm) generated by the engine (4);

a brake pedal (13) which modulates a brake torque acting on the vehicle (1);

a number of sensors (16) for real-time detecting respective dynamic parameters of the vehicle (1);

a regulating device (24) for regulating the lock percentage (%L) of the differential (9); and

a central control unit (15) for controlling the regulating device (24) to regulate the lock percentage (%L) of the differential (9) as a function of the dynamic parameters of the vehicle (1);

the vehicle (1) is characterized in that when cornering the central control unit (15) reduces the lock percentage (%L) of the differential (9) when the accelerator pedal (14) is pressed and increases the lock percentage (%L) of the differential (9) when the accelerator pedal (14) is released.

2) A vehicle (1) as claimed in Claim 1, wherein the self-locking differential (9) comprises a box body (17); a bevel gear pair (18) housed in the box body (17), and

which transmits the drive torque (Tm) to the two rear drive wheels (3) by means of respective axle shafts (10); and a lock device (19) for partly locking one axle shaft (10) with respect to the box body (17); the lock device (19) comprising a clutch (20) in turn having a number of disks (23) integral with one of the axle shafts (10), and a thrust chamber (21) filled with a fluid (22) under pressure (P) to exert variable axial thrust on the disks (23).

3) A vehicle (1) as claimed in Claim 2, wherein the regulating device (24) regulates the pressure (P) of the fluid (22) inside the thrust chamber (21).

4) A vehicle (1) as claimed in Claim 3, wherein the regulating device (24) comprises a solenoid valve (31) for selectively connecting the thrust chamber (21) to a tank (25) into which the fluid (22) is drained, or to a tank (29) for supplying the fluid (22) under pressure (P).

5) A vehicle (1) as claimed in Claim 4, wherein the central control unit (15) estimates a target value of the lock percentage (%L) of the differential (9) as a function of the dynamic parameters of the vehicle (1), estimates a target value (Prif) of the pressure (P) of the fluid (22) inside the thrust chamber (21) as a function of the target value of the lock percentage (%L) of the differential (9), and controls the solenoid valve (31) to apply inside the thrust chamber (21) the target value (Prif) of the pressure (P) of the fluid (22).

6) A vehicle (1) as claimed in Claim 5, wherein the regulating device (24) comprises a first sensor (36) for detecting the value of the pressure (P) of the fluid (22) inside the thrust chamber (21), and a second sensor (37) for detecting the value of the current (I) circulating through the solenoid valve (31); the central control unit (15) controlling the value of the pressure (P) of the fluid (22) inside the thrust chamber (21) by means of a first control loop employing as a feedback variable the value of the pressure (P) of the fluid (22) inside the thrust chamber (21), and a second control loop within the first control loop and employing as a feedback variable the value of the current (I) circulating through the solenoid valve (31).

7) A vehicle (1) as claimed in one of Claims 1 to 6, wherein the central control unit (15) controls the regulating device (24) to regulate the lock percentage (%L) of the differential (9) as a function of the travelling speed (V) of the vehicle (1), the turning angle (Dvol) of the vehicle (1), the yaw speed (Psip) of the vehicle (1), the lateral acceleration (Ay) of the vehicle (1), the longitudinal acceleration (Ax) of the vehicle (1), the rotation speed (WrearL, WrearR) of each rear drive wheel (3), the position (Pacc) of the accelerator pedal (14), the position (Pbra) of the brake pedal (13), and the drive torque (Tm).

8) A vehicle (1) as claimed in one of Claims 1 to 7, wherein the reduction in the lock percentage (%L) of the

differential (9) is proportional to the lateral acceleration (Ay) of the vehicle (1), the speed (V) of the vehicle (1), and the drive torque (Tm) of the engine (4).

9) A vehicle (1) as claimed in one of Claims 1 to 8, wherein the central control unit (15) reduces the drive torque (Tm) of the engine (4) to limit the power oversteering effect.

10) A vehicle (1) as claimed in one of Claims 1 to 9, wherein, when cornering at substantially steady speed, the central control unit (15) estimates the road grip of the wheels (2, 3), zeroes the lock percentage (%L) of the differential (9) when the road grip of the wheels (2, 3) is far from the grip limit, and gradually increases the lock percentage (%L) of the differential (9) when the road grip of the wheels (2, 3) nears the grip limit.

11) A vehicle (1) as claimed in Claim 10, wherein the central control unit (15) reduces the lock percentage (%L) of the differential (9) to zero when the road grip of the wheels (2, 3) is almost at the grip limit.

12) A vehicle (1) as claimed in Claim 10 or 11, wherein, as the road grip of the wheels (2, 3) nears the grip limit, the central control unit (15) gradually increases the lock percentage (%L) of the differential (9) in proportion to the value of the lateral acceleration (Ay) of the vehicle (1) and the value of the speed (V) of the vehicle (1).

13) A vehicle (1) as claimed in Claim 10, 11 or 12,

wherein the central control unit (15) zeroes the lock percentage (%L) of the differential (9) when the value of the turning angle (Dvol) of the vehicle (1) is substantially directly proportional to the value of the lateral acceleration (Ay) of the vehicle (1), and gradually increases the lock percentage (%L) of the differential (9) when no substantially direct proportion relationship exists between the value of the turning angle (Dvol) of the vehicle (1) and the value of the lateral acceleration (Ay) of the vehicle (1).

14) A vehicle (1) as claimed in one of Claims 10 to 13, wherein the central control unit (15) estimates the road grip of the wheels (2, 3) by estimating the value of the lateral acceleration (Ay) of the vehicle (1).

15) A vehicle (1) as claimed in one of Claims 10 to 13, wherein the central control unit (15) estimates the road grip of the wheels (2, 3) by estimating the value of the turning angle (Dvol) of the vehicle (1) and value of the lateral acceleration (Ay) of the vehicle (1).

16) A vehicle (1) as claimed in one of Claims 1 to 15, wherein, when driving along a substantially straight route, the central control unit (15) zeroes the lock percentage (%L) of the differential (9) in normal driving mode, and gradually increases the lock percentage (%L) of the differential (9) in sport driving mode.

17) A vehicle (1) as claimed in one of Claims 1 to 16, and comprising two axle shafts (10), each connecting the self-locking differential (9) mechanically to a

respective rear wheel (3); and two torque sensors (16), each of which is connected to the central control unit (15), is fitted to a respective axle shaft (10), and real-time detects the value of the torque transmitted by the self-locking differential (9) to the respective rear wheel (3) via the relative axle shaft (10); the central control unit (15) controlling the regulating device (24) to regulate the lock percentage (%L) of the differential (9) as a function of the value of the torque transmitted by the self-locking differential (9) to each rear wheel (3).

18) A vehicle (1) as claimed in Claim 17, wherein each torque sensor (16) is electromagnetic, and measures electromagnetically the torsional deformation of the respective axle shaft (10) to determine the value of the torque transmitted by the axle shaft (10) to the relative rear wheel (3).

19) A vehicle (1) as claimed in Claim 17 or 18, wherein the central control unit (15) predicts time changes in the angular rotation speed of each rear wheel (3), using the value of the torque transmitted by respective axle shaft (10), and controls the regulating device (24) to regulate the lock percentage (%L) of the differential (9) as a function of future time changes in the angular rotation speed of each rear wheel (3).

20) A vehicle (1) as claimed in Claim 17, 18 or 19, wherein the central control unit (15) estimates a target value of the lock percentage (%L) of the differential (9)

as a function of the dynamic parameters of the vehicle (1), and controls the regulating device (24) by means of a feedback control loop employing as a feedback variable the value of the lock percentage (%L) of the differential (9).

21) A vehicle (1) as claimed in Claim 20, wherein the regulating device (24) comprises a solenoid valve (31) controlled to vary the lock percentage (%L) of the differential (9), and a second sensor (37) for detecting the value of the current (I) circulating through the solenoid valve (31); the central control unit (15) controlling the regulating device (24) by means of a first control loop employing the value of the lock percentage (%L) of the differential (9) as a feedback variable, and a second control loop within the first control loop and employing as a feedback variable the value of the current (I) circulating through the solenoid valve (31).

22) A vehicle (1) as claimed in Claim 17, 18 or 19, wherein the central control unit (15) estimates a target value of the lock percentage (%L) of the differential (9) as a function of the dynamic parameters of the vehicle (1), and controls the regulating device (24) by adding a feedback control loop employing the value of the lock percentage (%L) of the differential (9) as a feedback variable, and a direct open control loop employing the target value of the lock percentage (%L) of the differential (9) as a control variable.

23) A vehicle (1) as claimed in Claim 22, wherein the regulating device (24) comprises a solenoid valve (31) controlled to vary the lock percentage (%L) of the differential (9), and a second sensor (37) for detecting the value of the current (I) circulating through the solenoid valve (31); the central control unit (15) controlling the regulating device (24) by means of a first control loop employing the value of the lock percentage (%L) of the differential (9) as a feedback variable, and a second control loop within the first control loop and employing as a feedback variable the value of the current (I) circulating through the solenoid valve (31).

24) A rear-drive vehicle (1) comprising:

a self-locking differential (9);

two axle shafts (10), each connecting the self-locking differential (9) mechanically to a respective rear wheel (3);

a number of sensors (16) for real-time detecting respective dynamic parameters of the vehicle (1);

a regulating device (24) for regulating the lock percentage (%L) of the differential (9); and

a central control unit (15) for controlling the regulating device (24) to regulate the lock percentage (%L) of the differential (9) as a function of the dynamic parameters of the vehicle (1);

the vehicle (1) is characterized by comprising two torque sensors (16), each of which is connected to the

central control unit (15), is fitted to a respective axle shaft (10), and real-time detects the value of the torque transmitted by the self-locking differential (9) to the respective rear wheel (3) via the relative axle shaft (10); the central control unit (15) controlling the regulating device (24) to regulate the lock percentage (%L) of the differential (9) as a function of the value of the torque transmitted by the self-locking differential (9) to each rear wheel (3).

25) A vehicle (1) as claimed in Claim 24, wherein each torque sensor (16) is electromagnetic, and measures electromagnetically the torsional deformation of the respective axle shaft (10) to determine the value of the torque transmitted by the axle shaft (10) to the relative rear wheel (3).

26) A vehicle (1) as claimed in Claim 24 or 25, wherein the central control unit (15) predicts time changes in the angular rotation speed of each rear wheel (3), using the value of the torque transmitted by respective axle shaft (10), and controls the regulating device (24) to regulate the lock percentage (%L) of the differential (9) as a function of future time changes in the angular rotation speed of each rear wheel (3).

27) A vehicle (1) as claimed in Claim 24, 25 or 26, wherein the central control unit (15) estimates a target value of the lock percentage (%L) of the differential (9) as a function of the dynamic parameters of the vehicle (1), and controls the regulating device (24) by means of

a feedback control loop employing as a feedback variable the value of the lock percentage (%L) of the differential (9).

28) A vehicle (1) as claimed in Claim 27, wherein the regulating device (24) comprises a solenoid valve (31) controlled to vary the lock percentage (%L) of the differential (9), and a second sensor (37) for detecting the value of the current (I) circulating through the solenoid valve (31); the central control unit (15) controlling the regulating device (24) by means of a first control loop employing the value of the lock percentage (%L) of the differential (9) as a feedback variable, and a second control loop within the first control loop and employing as a feedback variable the value of the current (I) circulating through the solenoid valve (31).

29) A vehicle (1) as claimed in Claim 24, 25 or 26, wherein the central control unit (15) estimates a target value of the lock percentage (%L) of the differential (9) as a function of the dynamic parameters of the vehicle (1), and controls the regulating device (24) by adding a feedback control loop employing the value of the lock percentage (%L) of the differential (9) as a feedback variable, and a direct open control loop employing the target value of the lock percentage (%L) of the differential (9) as a control variable.

30) A vehicle (1) as claimed in Claim 29, wherein the regulating device (24) comprises a solenoid valve

(31) controlled to vary the lock percentage (%L) of the differential (9), and a second sensor (37) for detecting the value of the current (I) circulating through the solenoid valve (31); the central control unit (15) controlling the regulating device (24) by means of a first control loop employing the value of the lock percentage (%L) of the differential (9) as a feedback variable, and a second control loop within the first control loop and employing as a feedback variable the value of the current (I) circulating through the solenoid valve (31).

31) A rear-drive vehicle (1) comprising:

a self-locking differential (9);

an engine (4) producing a drive torque (Tm) which is transmitted to the rear drive wheels (3) by the self-locking differential (9);

an accelerator pedal (14) which modulates the drive torque (Tm) generated by the engine (4);

a brake pedal (13) which modulates a brake torque acting on the vehicle (1);

a number of sensors (16) for real-time detecting respective dynamic parameters of the vehicle (1);

a regulating device (24) for regulating the lock percentage (%L) of the differential (9); and

a central control unit (15) for controlling the regulating device (24) to regulate the lock percentage (%L) of the differential (9) as a function of the dynamic parameters of the vehicle (1);

the vehicle (1) is characterized in that when cornering at substantially steady speed, the central control unit (15) estimates the road grip of the wheels (2, 3), zeroes the lock percentage (%L) of the differential (9) when the road grip of the wheels (2, 3) is far from the grip limit, and gradually increases the lock percentage (%L) of the differential (9) when the road grip of the wheels (2, 3) nears the grip limit.

32) A vehicle (1) as claimed in Claim 31, wherein the central control unit (15) reduces the lock percentage (%L) of the differential (9) to zero when the road grip of the wheels (2, 3) is almost at the grip limit.

33) A vehicle (1) as claimed in Claim 31 or 32, wherein, as the road grip of the wheels (2, 3) nears the grip limit, the central control unit (15) gradually increases the lock percentage (%L) of the differential (9) in proportion to the value of the lateral acceleration (Ay) of the vehicle (1) and the value of the speed (V) of the vehicle (1).

34) A vehicle (1) as claimed in Claim 31, 32 or 33, wherein the central control unit (15) zeroes the lock percentage (%L) of the differential (9) when the value of the turning angle (Dvol) of the vehicle (1) is substantially directly proportional to the value of the lateral acceleration (Ay) of the vehicle (1), and gradually increases the lock percentage (%L) of the differential (9) when no substantially direct proportion relationship exists between the value of the turning

angle (Dvol) of the vehicle (1) and the value of the lateral acceleration (Ay) of the vehicle (1).

35) A vehicle (1) as claimed in one of Claims 31 to 34, wherein the central control unit (15) estimates the road grip of the wheels (2, 3) by estimating the value of the lateral acceleration (Ay) of the vehicle (1).

36) A vehicle (1) as claimed in one of Claims 31 to 34, wherein the central control unit (15) estimates the road grip of the wheels (2, 3) by estimating the value of the turning angle (Dvol) of the vehicle (1) and value of the lateral acceleration (Ay) of the vehicle (1).

37) A vehicle (1) as claimed in one of Claims 31 to 36, wherein, when driving along a substantially straight route, the central control unit (15) zeroes the lock percentage (%L) of the differential (9) in normal driving mode, and gradually increases the lock percentage (%L) of the differential (9) in sport driving mode.

38) A rear-drive vehicle (1) comprising:

a self-locking differential (9);

an engine (4) producing a drive torque (Tm) which is transmitted to the rear drive wheels (3) by the self-locking differential (9);

an accelerator pedal (14) which modulates the drive torque (Tm) generated by the engine (4);

a brake pedal (13) which modulates a brake torque acting on the vehicle (1);

a number of sensors (16) for real-time detecting respective dynamic parameters of the vehicle (1);

a regulating device (24) for regulating the lock percentage (%L) of the differential (9); and

a central control unit (15) for controlling the regulating device (24) to regulate the lock percentage (%L) of the differential (9) as a function of the dynamic parameters of the vehicle (1);

the vehicle (1) is characterized in that when driving along a substantially straight route, the central control unit (15) zeroes the lock percentage (%L) of the differential (9) in normal driving mode, and gradually increases the lock percentage (%L) of the differential (9) in sport driving mode.